

THERMAL PROPERTIES OF EUROPA'S ICE SHELL. J. R. Spencer¹, ¹Lowell Observatory, 1400 W. Mars Hill Rd., Flagstaff, AZ 86001, spencer@lowell.edu.

I will review our current knowledge of surface and subsurface temperatures on Europa. Daytime and nighttime surface temperatures have been extensively mapped by the Galileo Photopolarimeter-Radiometer (PPR) instrument, and vary between 130 and 80 K at low latitudes. Nighttime temperatures show complex and poorly-understood spatial variations, including a remarkable temperature minimum centered on and parallel to the equator on the leading hemisphere. Comparison with daytime temperatures indicates that these patterns are controlled by spatial variations in thermal inertia rather than by warming of the surface by endogenic heat, but the cause of the thermal inertia variations is not understood.

The amplitude of the diurnal temperature variations is matched with a thermal inertia of about $5 \times 10^4 \text{ erg cm}^{-2} \text{ s}^{-1/2} \text{ K}^{-1}$, fifty times lower than the value for solid ice, indicating that much of the uppermost few centimeters of Europa's surface has high porosity and thus low thermal conductivity. Daytime temperatures are high enough that significant sublimation of H₂O ice is likely on geological timescales, leading to thermal segregation of ice into high-albedo patches that are colder than the average surface.

Less is known about subsurface temperatures in Europa's ice shell, though it is likely that there is an upper conducting layer, with a steep thermal gradient, overlying a lower convecting layer that is almost isothermal at temperatures slightly below the melting temperature of the ice.

Localized endogenic resurfacing may produce long-lived passive or active anomalies in surface temperature, providing a promising technique for detecting regions of recent resurfacing from Europa orbit. No such anomalies were definitively identified in the Galileo PPR data, however.